MASTER'S THESIS

Enabling sourcing decision making: identification of IT resources using a validated reference model

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Abstract

Using a design science approach, this study developed a framework to identify IT assets, IT capabilities and underlying coherences in an outsourcing context. Using a single case study in a large governmental organization with seven participants from various levels of involvement with outsourcing decision making, we were able to validate the model whilst revealing several areas for improvement. Respondents involved on a daily base with outsourcing decision making prefer a more detailed model and advise to broaden the scope of the model by including business aspects. All respondents acknowledged useful applications for the model, including internal assessment, monitoring, and evaluation of the cooperation with IT service providers, enabling them to prioritize IT gaps within their company. Several assets and capabilities are often outsourced in combination, which is identified both respondent's answers and literature and provides cause for follow-up research. Limited by a small number of interviews in a single case organization this is a first attempt for further research. Including cases in the future would allow for extrapolation of the current findings. Our model can provide a valuable evaluation tool for both decision makers and directions for future research.

Key terms

Outsourcing, framework, IT assets, IT capabilities, IT resources

Summary

This study adds a validated framework that can be used for identification of IT assets, capabilities and underlying coherences in an outsourcing environment. All participants in our single case study acknowledged the usefulness of the model. Two potential usages to the model were dominantly mentioned, using the model as an internal analysis tool and using the model as an outsourcing monitoring tool.

Model development
The development of the reference model is a result of seven literature studies, followed by an iteration of assessment and redesign before it was empirically tested. We validated our framework by plotting outsourcing activities that occurred within a single case. The case organization provided seven participants from various organizational layers, meaning different involvement with the same outsourcing activity. Recently a large IT outsourcing took place in the organization, focussing mainly on application development, infrastructure and architecture.

Preferred level of detail
We found preference of detail was associated with the involvement of respondents in outsourcing decisions making. There were mutual discrepancies between respondents on the desired level of detail the model should have. Our study gives an indication that the extent to which a respondent is involved on a daily base with outsourcing decision making, affects the degree of detail they expect from the model. The higher the involvement of the respondent in outsourcing decisions, the more detail is preferred. Respondents nuance that the maturity of companies determines the level of detail they prefer to work with, where start-ups prefer to work on a more abstract level of outsourcing. Also, the maturity of a cooperation between a company and outsourcing vendor determines the level of detail the model needs. An existing relationship between companies requires less detail.

Clarity of definitions used
Three respondents needed no further explanation of the definitions used in the model, since they recognize these definitions from either practice of similar models they have worked with. This is related to their job function. Three respondents propose the split of the model between assets and capabilities is confusing, and one respondent adds that a model based on only capabilities is preferred. We found that providing a good set of examples works better than the set of definitions that was used in the study. This indicates room for further clarification of definitions, however, respondents added that there are many models, each using their own set of definitions but talk about the same things. It should be considered that due to the differences between available models, clarity of definitions used is difficult to establish.

Completeness of the model
Respondents made the recommendation to include business categories in the model, to not limit the scope to IT and increase usefulness. Respondents stated strategy cannot be outsourced and should therefore not be included in the model. Interestingly, respondents propose to base the model on ITIL frameworks, however existing literature debates the added value of doing this, because the adoption of ITIL in outsourcing yields similar outcomes as compared to outsourcings where ITIL had not been implemented and that ITIL practitioners' competency determines the success. Furthermore, respondents stated that outsourcing is a ration between internal and external activities, this distinction should be clear from the model.

Usefulness and application of the model
Respondents with high involvement in outsourcing decisions recognize and acknowledge the use of such models from practice but argue about useful applications and completeness. Two major applications are proposed, using the model as a means for internal analysis in the preparation of future outsourcings and using the model for monitoring the outsourcing contract.

Assets and capabilities outsourced together
By plotting the results of the study on a heatmap, a first attempt was made to schematically display coherences of IT assets and capabilities that are outsourced together. Not only did this indicate the functionality of the model, since outsourcings could be plotted on it in such a fashion it also gives an indication that IT assets and capabilities are outsourced together. Respondents indicated in the model which aspects were outsourced in their organization, in our case, mainly infrastructure, architecture and applications. This study proposes further research should be performed on these combinations of assets and capabilities that are outsourced together and gives an example of how such follow-up research could be performed.

Contents

1. Introduction

1.1 Background

Over the years organizations attained Information Technology (IT) resources to drive digital transformations and gain competitive advantage (Ashrafi & Mueller, 2015). IT resources need to be managed in a way that is both profitable and sustainable (Clemons & Row, 1991), forming a complex chain of assets and capabilities (Wade & Hulland, 2004).

To maximize the benefit of IT resources (Lacity, Khan, Yan, & Willcocks, 2010), firms need to make well considered sourcing decisions, therefore they need to possess the ability to gather knowledge of existing IT resources and status (Dahlberg & Kivijärvi, 2006). Various methods were developed for this purpose (van der Raadt, Bonnet, Schouten, & van Vliet, 2010; Wade & Hulland, 2004), but many still lack methodological consistency (Simon, Fischbach, & Schoder, 2013), rendering firms unable to make well considered decisions.

The question rises what IT resources are and how can they be identified in a structured and validated way. We aim to construct a reference model which can be used to make a structured inventory of IT resources, based on existing literature using a design science approach (Hevner, March, Park, & Ram, 2004). Subsequently, this study attempts to validate the reference model in an empirical research.

1.2 Exploration of the topic

IT resources

IT resources consist of IT assets and IT capabilities to manage them (Wade & Hulland, 2004), and should be valuable, imperfectly imitable and firms must have sound organizational policies and procedures (Ashrafi & Mueller, 2015; Barney, 1991). IT resources are defined as available technology, people, data and processes that managers use in an organization to perform business processes and tasks (Piccoli & Ives, 2005).

There is a strong relation between IT capabilities and the degree firms can benefit from their IT assets (Ashrafi & Mueller, 2015; Kim et al., 2011; Nwankpa & Roumani, 2016; Zhang, Wang, & Zhuang, 2017). Studies describe IT assets as *"IT investments allocated for particular strategic purposes"* and IT capabilities as *"Interlocking systems of practices and competencies that complement IT"* (Aral & Weill, 2007).

IT assets are anything, tangible or intangible, that can be used by a firm in its processes for creating, producing, and/or offering its goods and services (Piccoli & Ives, 2005) and are defined as hardware, software and information (Mesa, Fleras, Pagdato, & Yu, 2014). IT assets are viewed as the technical foundation for related IT capabilities (Wang, Shi, Nevo, Li, & Chen, 2015).

IT capabilities are described as a firm's ability to assemble and deploy IT-based resources in combination with other firms' resources (Nwankpa & Roumani, 2016) and consist of technical skills, IT management skills and relationship skills. IT capabilities are developed over time for firms to create, produce, or offer its products, making it possible to use IT assets effectively (Piccoli & Ives, 2005).

Sourcing

Sourcing is a strategic effort to lower IT costs and allow firms to focus on core activities (Roy & Aubert, 2002). It can be defined as the ability to acquire, manage and maintain IT resources, while deciding to insource, co-source or outsource (Wade & Hulland, 2004). Deciding between either in-, co- or outsourcing depends on a firm's ability to acquire and exchange specific knowledge (Cha, Pingry, & Thatcher, 2009) and on the production cost advantage that is potentially achieved (Ang & Straub, 1998). Sourcing is rarely limited to a single asset or capability but a handover of activities (Aubert, Rivard, & Patry, 2004), often a

complex of elements that are outsourced. Outsourcing complexity further supports the presumption that firms need to understand their existing IT resources and status before being able to make sourcing decisions (Dahlberg & Kivijärvi, 2006).

Reference model
A reference model is an information model for supporting the construction of other models, enabling the establishment of a single language in which to communicate about specific concepts and definitions in a research setting (Thomas, 2006). Reference models should be universally applicable and reusable (Pajk & Kovacic, 2013). Amongst various types of reference models, we attempt to construct and validate a procedural reference model with a specified classification scheme (Fettke & Loos, 2003).

1.3 Problem statement
By acquiring, managing and maintaining the right IT resources and make the right sourcing decisions, firms gain a competitive and sustainable advantage. However, there is little theoretical consistency on what IT resources are and how these decisions should be made. The lack of available reference models for sourcing decisions in existing literature, there is a gap of knowledge which could provide an issue for firms that want to manage their IT resources and make sourcing decisions.

1.4 Research objective and questions
We seek to understand what IT resources are and based on this knowledge develop a reference model through which IT resources can be identified in organizations. To assess the reusability and applicability in an outsourcing context, this model is validated. Discussing the model with practitioners should yield valuable insights and improvements.

The main research question is *"Can a useful and manageable reference model be developed and validated that allows identification of IT resources in a structured and validated way?"*. The objective of the research is can be addressed in following sub-questions:

1) Which IT resources are there and how detailed should the model describe them?
2) How can the model display coherences between IT resources that are outsourced together?
3) What useful applications does the model have to help make better sourcing decisions?

1.5 Motivation/relevance
Much research has been performed on the relation between IT assets and capabilities (Aral & Weill, 2007; Ashrafi & Mueller, 2015; Wang et al., 2015; Zhang et al., 2017), specifically the effect on firm performance has drawn much attention in recent research (Li, Su, Zhang, & Mao, 2018). However, reference models to identify IT resources in organizations appear relatively untouched in existing literature. This research attempts to contribute to existing body of literature by providing an insight in what are IT assets and capabilities and how to identify them using a validated reference model. Subsequently, this should provide organizations with knowledge and tools that allow for understanding and identifying their actual IT resources, to make better sourcing decisions.

1.6 Main lines of approach
A literature study is performed in chapter 2, focussing on IT resources and existing reference models. Chapter 3 describes the methodology of how the research will be executed. Results will be presented in chapter 4, followed by the discussion, conclusion and recommendations in chapter 5.

2. Theoretical framework

2.1 Research approach

We reviewed the literature to place the main research question in context and find evidence of IT assets, capabilities and relations. We performed structured search queries in the Open University library, followed by a snowball approach and queries on scholar.google.com, to answer the following questions:

- *Which definitions of IT assets and capabilities are available, and which are most suitable in the context of this study?*
- *Are there any aspects that could reveal the relation between IT assets and capabilities, and can this provide useful insights for this study?*
- *How suitable are these IT resources definitions when used to operationalize this research and are they defined in existing reference models?*

Literature study: The Open University digital library contains various search engines such as EBSCO Host and JSTOR. The results are limited to peer-reviewed articles no older than 12 years, that are accessible from the Open University Library that fall under the disciplines 'business', 'economics', 'applied science' and 'computer science' are searched for. Research subjects included in the query are 'business', 'capabilities', 'computer science, information systems', 'Information technology' and 'Management science'.

The search query was defined as follows:

- ("IT-asset") AND ("related capability") – yielded 1.397 results
- ("IT-resources") AND ("IT-asset") AND ("related capability") – yielded 561 results
- ("IT-resources") AND ("IT-asset") AND ("IT-capability") AND ("related capability") – yielded **291 results**

The final 291 results were structurally assessed in the following steps – read the title, read the abstract, read the conclusions and discussion, read the full article. Irrelevant articles are discarded from the results.

Snowball study: The reference lists from the selected articles are reviewed and selected when they appear relevant. Also, the other way around, citations for these selected articles are reviewed. The papers are assessed in the same fashion as the ones from the Open University Library.

Scholar.Google search: Searches on scholar.google.com are performed to find relevant articles that were not retrieved in the first two steps. Various combinations of the definitions 'IT-assets' 'IT-capabilities' and 'IT-resources' are entered, the titles of the articles on the first two results pages are reviewed and the search query is altered. These steps are repeated various times.

2.2 Implementation

291 articles were reviewed in a structured fashion and selected as follows:

("IT-resources") AND ("IT-asset") AND ("IT-capability") AND ("related capability")	
Total number of articles found with the query	291
Selected based on title	25
Selected based on abstract	20
Selected based on conclusion/discussion/full text	1

The following article was selected:

- *Fink (2007) Gaining agility through IT personnel capabilities: The mediating role of IT infrastructure capabilities*

This article was cited 269 times according to scholar.google.com, subsequently the author used 83 references to other articles.

Citations	
Total number of articles found with the query	269
Selected based on title	6
Selected based on abstract	4
Selected based on conclusion/discussion/full text	2

The following articles were selected:

- *Huang (2010) A Resource-based Analysis of IT Personnel Capabilities and Strategic Alignment*
- *Liu (2018) The Relationship between Information Systems (IS) Assets, Organizational Capabilities, and IS enabled Absorptive Capacity in U.S. State Information Technology Departments*

References	
Total number of articles found with the query	83
Selected based on title	7
Selected based on abstract	2
Selected based on conclusion/discussion/full text	0

During the final scholar.google.com search a final article was selected:

- *Eldin (2016) impact of IT Resources on IT Capabilities in Sudanese Insurance and Banking Sectors*

2.3 Results and conclusions of literature study

No consistent definitions of IT assets and capabilities were found. We used overlapping definitions for the formulation of IT assets and capabilities. Table 1 summarizes the identified IT capabilities, table 2 the identified IT assets.

IT capabilities

Fink (2007) defines IT personnel capabilities and IT infrastructure capabilities. IT personnel capabilities consist of Business capability, Behavioural capability and Technical capability. IT infrastructure capabilities are defined as “The ability of the IT unit to provide extensive firm-wide IT infrastructure services that support the organization's business processes”. Eldin (2016) also uses the definition IT-infrastructure capability and refers to it as ‘Connectivity and modularity of software, Compatibility integration capabilities and adaptability (IT human skill)’. We adopted the broad definition of Fink (2007).

Amongst IT personnel capabilities, Fink (2007) distincts Behavioural, Business and Technical capability, whereas Huang (2010) only distinguishes Business and Technical capability. Both authors refer to Business capabilities as ‘company specific knowledge and the ability to learn about business functions’ and to Technical capabilities as ‘database management skills and competency in adoption of emerging technologies. Other authors don’t have separate definition for behavioural capability as described by Fink (2007) as ‘effective interpersonal communication and working in collaborative environments.

Eldin (2016) describes the IT functional capability as ‘IT production capability, service enhancement capability and management capability’ which relates to the definition of Liu (2018) of Organizational capabilities as ‘repeatable pattern of actions that culminates in a firm’s ability to combine, integrate, and deploy assets/resources’. Eldin (2016) however makes a separation between internal and external functional capabilities.

Eldin (2016) describes IT management practice and employee empowerment as the strategic ability to plan and coordinate IT resources. This appears to relate closely to the definition of Huang (2010) of

Strategic alignment (IS-business plan and business-IS plan) companies must be able to mobilize and deploy IT-based resources with other organizational resources.

Table 1: summary of IT capabilities and definitions

IT capability	Definition	Author
IT Infrastructure capability	The ability to provide firm-wide IT infrastructure services that support the organization's business processes	Fink (2007) Eldin (2016)
IT personnel capability Behavioural capability	The interpersonal and management ability of IT personnel to interact with and manage others	Fink (2007)
IT personnel capability Business capability	Company specific knowledge and the ability to learn about business functions	Fink (2007) Huang (2010)
IT personnel capability Technical capability	Database management skills and competency in adoption of emerging technologies	Fink (2007) Huang (2010)
IT functional and organizational capability	A firm's IT production capability which consists of a repeatable pattern of actions that results in an ability to combine, integrate and deploy assets/resources'	Eldin (2016) Liu (2018)
IT Management practice and employee empowerment	Strategic capability to plan and coordinate IT resources in combination with other non-IT resources	Eldin (2016) Huang (2010)

IT-assets

Liu (2018) describes two IT assets; Outside-in IT assets which is referred to as a 'An IT asset that allows customers to share knowledge, which is an external source of knowledge that can be used by the IT department to develop external relationships' and Inside-out IT assets which is the opposite of an Outside-in IT assets and is defined as 'IT assets that enhance a firm's ability to take advantage of market opportunities and increase an organization's knowledge application capability'. Both definitions described by Liu (2018) fall under the Enterprise Computing Technology assets described by Eldin (2016). Liu (2018) refers to CRM and ERP systems, also mentioned by Eldin (2016). Eldin (2016) further distinguishes core communication technology, which refers to the internal networks, infrastructure and technology that enables a firm's communication abilities. Group collaboration technology refers to technology that enables individuals to engage in a common task to collaborate using electronic technology.

Table 2: summary of IT assets and definitions

IT asset	Definition	Author
Core communication technology	IT assets and infrastructure that enable a firm's core communication technology	Eldin (2016)
Enterprise computing technology	IT assets that support institutionalized sequential transactions between work units supporting sequential interactions between users allowing them to structurally exchange data	Eldin (2016) Liu (2018)
Group collaboration technology	IT assets that support collaboration between individuals engaged in a common task using electronic technology.	Eldin (2016)

Are there any aspects that could reveal the relationship between IT asset and capability, and can this provide useful insights for this study?

The relations identified between the aspects are displayed in table 3.

Table 3: summary of identified relations between assets and capabilities

ID	IT asset	IT capability	Relationship	Author
R_1	Enterprise computing technology	IT functional and organizational capability	The type of asset (e.g. Workflow management system, CRM, ERP, Project management system), is a determinant for the relationship toward IT Functional and organizational capabilities. Specifically, a firms ERP or CRM adoption positively impacts the IT functional and organizational capabilities (Liu, Armstrong, & Riemenschneider, 2018)	Liu (2018) Eldin (2016)
R_2	Core communication technology AND Group collaboration technology AND Enterprise computing technology	IT Infrastructure capability IT functional and organizational capability IT Management practice and employee empowerment	Core communication, Group collaboration and Enterprise computing technology complement each other and together generate outcome for the all IT capabilities (Eldin, Ali, & Al-Tit, 2016)	Eldin (2016)
R_3	Core communication technology	IT Infrastructure capability	Core communication technology specifically positively impacts IT infrastructure capability (Eldin et al., 2016)	Eldin (2016)

How suitable are these IT assets and capabilities definitions when used to operationalize this research and are they defined in existing reference models?

The identified definitions and relations should provide a useful starting point for operationalisation of this research. Combining the various definitions into single IT asset and capability definitions, is an interpretation of the author which might reduce the reliability of the developed reference model. Development of the model is limited by the diversity of IT asset and capability definitions.

Theoretical framework

An initial theoretical framework is developed and displayed in table I, appendix 2. A definitive theoretical framework is developed combining the other literature studies.

2.4 Objective of the follow-up research

Objective of follow-up research is to develop and validate a model in collaboration with other researchers. By plotting real-life outsourcings on the developed model and discussing this with practitioners, an attempt can be made to validate the model and provide insights on usefulness and manageability.

3. Methodology

Because there are no available IT outsourcing frameworks that this study can build upon, a suitable model will be developed. The design science paradigm closely suits this nature, for developing, assessing and validating the model, by extending existing knowledge and testing this in a relevant environment (Hevner et al., 2004). To do this, four design steps are used:

1) The model is developed based on the problem statement, research questions and identified literature by a group of seven researchers (initial model development);
2) The model is assessed in an initial evaluation with available IT outsourcing documentation, to evaluate the quality of the design (Hevner et al., 2004) (initial model evaluation).
3) Based on the initial model evaluation, redesign of the model can take place (model redesign)
4) The model is empirically tested, and feedback is collected to propose improvements (model validation in practice).

In future research this cyclical refinement process can be repeated until the model reaches the desired level of quality.

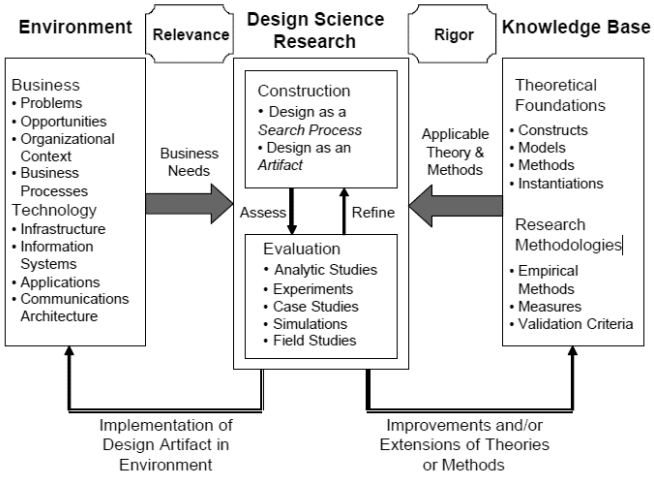

Figure 1: the design science framework (Hevner et al., 2004)

3.1 Initial model development

An initial model is developed by combining seven literatures studies into a single model. The advantage of this, is that literature is studied from various angles, which should provide a theoretical foundation. To process the collected data from the seven literature studies, which should yield a collection of IT assets, IT capabilities and coherences between these resources, data structuring and categorization is needed. A useful method to do this is card sorting, known as a categorisation task (Fincher & Tenenberg, 2005). Closed card sorting implies the dimensions of assets and capabilities are already known, open card sort implies they are not. Open card sort is most suitable, since categories are not yet known.

Open card sort is performed in the following way: all IT asset and capability definitions yielded from the literature studies are written on single cards and placed on a stack. All seven researchers, guided by a supervisor will, together, place a first card on the table, pick another card and discuss whether this card falls under the first category or should form a new category. Until all cards are sorted, a matrix of horizontally IT assets and capabilities vertically should appear. A third closed-card sort is performed for the relations. An extensive description of the card sorting session can be found in appendix 1.

3.2 Initial model evaluation

The model is tested in a pilot session and redesigned before field testing to determine the model quality and relevance to its environment (Hevner et al., 2004). If this step is not performed, there is a risk of field-testing a model that is of inferior quality and needs refinement, while time and effort is spent on collecting empirical data. Initial testing also provides an opportunity to identify improvements to the model.

Formal documentation regarding outsourcing activities, such as contracts between client and sourcing partner or project plans describing IT assets and capabilities in companies provides credible information for model evaluation. The existing categories are compared with those identified in the documentation, based on this, differences can be identified. All seven researchers will attempt to retrieve such documentation. The documents should have value and purpose for the company that developed them and therefor can be viewed as a credible source. Again, a card sorting session together with all research practitioners is a useful strategy because of the structured and objective way of processing the data. A closed cart sort is performed because the data can be compared with existing categories. If the collected documentation suggest new categories should be formed and cards can't be sorted under existing categories, a hybrid card sort is performed, combining aspects of open and closed cart sort. This can lead to additional categories of the model or adjusting the existing categories to fit additional data. The requirements and practical execution of the card sorting session will be the same as described in paragraph 1 of this chapter and can be found in appendix 1.

3.3 Model redesign

Based on the initial model evaluation, closed cart sort is applied to refine, add or delete categories. If the model needs refinement, a hybrid card sorting session is performed to combine closed and open card sort. Since the redesign is based on various organizations, it should provide confidence for validation in practice and a higher expected external validity.

3.4 Model validation in practice

3.4.1 Conceptual design

The initial validation of the model provides understanding to what are IT assets and capabilities and how they are related, therefor this step is exploratory in nature. The second part of this research aims to understand why IT assets and IT capabilities are related and how this relates to the model. This implies an in-depth understanding of the phenomena in a real-life setting (Saunders et al., 2015), therefore this study is descriptive and explanatory (Saunders et al., 2015).

A documentary research will not suffice for this purpose, neither would an experiment (experiment and control group) or survey (statistical analysis). Since some theoretical foundations are already present in existing literature, a grounded theory approach is not preferred due to its complexity and required effort. A case study will be performed to allow the researcher to understand the topic that is studied in-depth and within its real-life context.

3.4.2 Technical design: elaboration of the method

Case selection

Derived from the problem statement of this research, the case needs to meet the requirement that an enterprise acquires, manages and maintains IT resources and make sourcing decisions. Additionally, the case should have the following actors and events:

Actors – the case organization should be large enough to have some degree of organizational dimensions, so that the research topic can be discussed and understood from multiple management layers. Participants should include members of a senior management position for their strategic decision-making insight, a contract manager for information on the purchasing aspect of the outsourcing, a program manager that is overseeing the operational processes within the outsourced process and a stakeholder from the IT department for a technical perspective.

Events – the case should at least be active in outsourcing activities, or has been active in the last two years, to provide respondents that are able to discuss their experiences concerning in relation to this study.

Since only a single case study can be included due to time constraints of this study, purposive sampling will be applied, to ensure the case meets the case description (actors and events) as stated above. This should lead to data which is useful for the defined problem statement. Additionally, there is no opportunity for theoretical or literal replication, therefor a random selection will not suffice.

The case is embedded and not holistic because the unit of analysis focuses on only a part of the organizational activities; IT resources in an outsourcing setting. A holistic case study would broaden the scope too much and not yield the in-depth results that are needed for this research, or risk retrieval of irrelevant information.

Data retrieval

The required information from the case organisation should yield in-depth qualitative insights into the research topic. Although surveys are suitable for deductive research, they yield mainly quantitative data (Saunders et al., 2015). Therefor performing interviews is preferred to attain the required data. The interviewees are selected based on the defined actors. A disadvantage of performing interviews is that the researcher should be aware of bias, subjectivity and potentially time-consuming data analysis.

Interview strategy

Interviews will be held using an interview protocol, as described in appendix 3, to perform semi-structured interviews. The semi-structured nature is important, as this is more suitable for exploratory research, compared to structured interviewing. Follow-up questions allow to provide in-depth understanding of the topic, and establish personal contact (Saunders et al., 2015). Interviewees are requested to reconstruct a recent outsourcing, or outsourcing decision they were involved in, before the actual interview, to get prepared for the interview and allow some time to place the research in context of the organization. This helps increasing the reliability of the answers. The interview protocol is elaborated in appendix 4. Sessions will be recorded for processing of data afterwards, on the one hand, since this is handled anonymously so interviewees feel free to answer and reduce socially desirable answering. On the other hand, since this is a face-to-face interview, bias due to socially desirable answering is not ruled out.

Interview protocol and reflection

The interview consists of three topics, introduction to the model, questions on manageability and questions on usefulness, as discussed in table 4. For the complete interview protocol and reflection, see respectively appendix 3 and 4.

Table 4: summarized interview protocol and reflection

Part	Interview question	Reflection
Introduction	▪ Can you state your name and role in the company? ▪ Elaborate on a recent outsourcing activity in the organization, why it was considered, what was the outcome, what impact did the decision have on matters that were not outsourced? ▪ Can the outsourcing activity be placed in the model?	Intended result: Reliving the situation when preparing the interview and at the start of the interview so that the interviewee and the researcher have the same starting situation and can relate this to the model.
Questions on manageability	▪ Are the terms used clear, what could be improved and why? ▪ Do you think the model is complete, what needs to be added, what can be removed, and why? ▪ Is the level of detail of the information sufficient, if not, do you prefer a lower or higher level of detail, and why (yes / no)?	Intended result: The vision of the interviewee on the manageability of the model.
Questions on usefulness	▪ Can you give an example of a situation in which the model can be useful? ▪ Does the model provide information that can be useful in discussions and decisions regarding outsourcing? o If so, which and why? ▪ Can the model with possible extensions be useful? o If so, which and why? ▪ Do you have any other additions or comments regarding the potential usefulness of such a model?	Intended result: The vision of the interviewee on how the model can be useful for outsource decisions.

3.4.3 Data analysis

Data is transcribed and analysed through both open and axial coding (Saunders et al., 2015), using the programs RQDA and Excel.

Open coding is used to form categories on the collected data (in vivo for the answers regarding the usefulness of the model) or place data under existing categories (a priori for the answers regarding the completeness of the model, i.e. the IT assets and IT capabilities).

First, codes are applied according to the interview questions, for instance all answers regarding manageability receive a code ‘manageability’. Subsequently, a second code is applied in relation to the question asked, for instance ‘Are the terms used clear, what could be improved and why?’ receives the code ‘termsclear’, the explanation to this question (why) receives a third code ‘termsclearwhy’. Now axial coding can be performed, to find categories within the codes. All data coded ‘termsclear’ is analysed for themes, for instance ‘the terms used are unclear’, or ‘the terms used are clear’. In this way, it becomes clear what answers are given to which questions and whether they are shared by the respondents. All steps to code the data are described in appendix 5.

Depending on the collected data, coherences and patterns can be sought. For example, the answers given in relation to the job function and involvement in IT outsourcing decision making are compared. Data will

be schematically displayed so that interpretation is easier and more valuable. The model is ideally filled out by all respondents and plotted on a schematic overview to give an indication of assets and resources that are often outsourced in relation. Every category mentioned by the respondent will translate to a '+1' in the model, to be able to display which categories were mentioned most often.

3.4.4 Reflection on validity, reliability and ethical aspects

The major strength of this research is that the development of the reference model is a result of seven literature studies, followed by an iteration of assessment and redesign before it is empirically tested.

Internal and construct validity is established when the collected data is interpreted correctly, and the right conclusions are drawn. Using design science, we iteratively develop the model and adjust it based on retrieved information, leading to a valid instrument. The interview protocol is a measure to ensure data is collected systematically and requesting the interviewees to review their answers should ensure the collected data is valid. Internal validity is increased with the structure of the interview protocol, by first asking the interviewee to elaborate on their experiences and to place the outsourcing activities in the developed model. In this way, the participant is asked to relive the situation and should provide better answers. By linking the interview protocol to the data analysis and coding, the outcome should be more structured. The process of open and axial coding, which if needed is performed over multiple iterations, should lead to themes and codes that allow for answering the research questions correctly.

External validity is established if findings hold up in different settings and thus are generalizable. Using purposive sampling, the case selection should lead to external validity, and outcomes of this study should apply to similar cases that fits the criteria. Because the reference model is a result of seven literature studies, joint card sorting sessions and refinement according to documentation, the outcome should be applicable, and some scale is achieved.

Reliability is established if a subsequent researcher would arrive to the same insights based on the use of the data collection technique, observations made and processing of the raw data. Data collection techniques, procedures and data analysis can be repeated by another researcher. The design science steps are described and the card sorting process. The interview protocol and data processing strategy are replicable and by describing the case criteria, the study can be executed again in a similar environment using the same techniques. The interview protocol should reduce bias and error. Reliability is increased by handling interviews anonymously and explicatively stating this to the respondents. However, the chance for some socially acceptable answering and bias should be considered.

Ethics are an important aspect in research that involves human participants and access to data is needed (Saunders et al., 2015). Organizations will be requested access to data and physical access to the company premises. Attention will be paid to research ethics when collecting data, by giving the interviewee a preparation opportunity, recording the interviews and handling data anonymously, and deleting the recordings after transcription. The interviewee is made aware of this. No incentives are offered to participate, nor will interviewees be forced to answer questions they don't feel comfortable answering.

4. Results

4.1 Model development

The model was developed during a card sorting session attended by all seven researchers and a supervisor. The developed model is a product of seven literature studies, comparable to the study in this report, with different angles of approach (green IT, architecture, grey literature, risk management, maintenance and costs). Approximately 700 cards were sorted in accordance to a Metaplan (Howard, 1994), where an open card sorting session was followed by a close card sorting session leading to an initial model. Deviating from the model development plan, an online follow-up session took place where researchers individually worked out parts of the model in subcategories and definitions. During a model redesign session based on 5 collected documents on existing outsourcing agreements in case organization, various changes in the sub-categories were made. Notably the rearrangement of the facilities, middleware and infrastructure components assets and renaming business intelligence to data analytics.

Table 5 and 6 show the outcome of the final session, a list of IT capabilities and IT assets. The actual matrix which was used during interviews to identify coherences between assets and capabilities can be found in appendix 6 (figure I). A detailed overview of identified capabilities (table II) and assets (table III) including sources, examples and definitions can be found in appendix 7.

Table 5 Identified IT capabilities and sub categories

Category	**Sub category**
Strategy formation	▪ Develop strategy ▪ Execute strategy
Innovation	▪ Anticipation ▪ Process innovation ▪ Product innovation ▪ Technology application
Security	
IT vendor management	▪ IT vendor management
IT processes	▪ Development ▪ Implementation ▪ Maintenance
HRM (IT staff)	
End user training	
Architecture	▪ Planning ▪ Implementation ▪ Maintenance ▪ Management
Infrastructure	▪ Planning ▪ Implementation ▪ Maintenance ▪ Management
Applications	▪ Development ▪ Implementation ▪ Maintenance ▪ Management
Monitoring	
Data analytics	

Table 6 Identified IT assets and sub categories

Category	**Sub category**
Data	
Applications	
Infrastructure	▪ Facilities ▪ Hardware ▪ Network ▪ Software (middleware)
Communication- and cooperation systems	
Data analytics output	

The model is graphically displayed, including the participants' answers in figure 2. The participants and selected case are described in the next paragraph. Figure 2 displays which capabilities and assets were filled in based on actual outsourcings in the interviewees' organization. During the first part of the interview, the interviewees were asked to fill in the model based on actual outsourcing activities. They were asked to think about combinations of assets and capabilities that were outsourced together. The number of times they mentioned certain combinations, are represented by the number in the model.

For instance, three participants mentioned that IT process implementation was outsourced in combination with applications. Also mentioned three times was infrastructure planning in combination with applications and HRM (IT staff) in combination with applications.

IT CAPABILITY \ IT ASSET		Data	Applications	Infrastructure				Communication Systems	Data analytics output
				Data centre	Hardware	Network	Software		
Strategy formation	Develop				1				
	Execute								
Innovation	Anticipation				1				
	Process innovation		1						
	Product innovation		1						
	Technology application								
Security			2		2	1			
IT Vendor management					1				
IT Processes	Development		1						
	Implementation		3		1		1	2	
	Maintenance								
HRM (IT Staff)			3	1	2	1	1		
End user training							1		
Architecture	Planning		1						
	Implementation		1	1	1	1	1		
	Maintenance		1						
	Management		1		1	1			
Infrastructure	Planning		3						
	Implementation			1	1	1	1		
	Maintenance	1			1	1			
	Management								
Applications	Develop		1				1	1	
	Implement		1						
	Maintain		1						
	Manage		1						
Monitoring			1		1				1
Data Analytics			1						

Figure 2- a graphical display of the developed model including the respondent's answers

4.2 Case and respondent description

A large governmental (non-profit) organization met the requirements described in the methodology. The organization provided seven participants from various organizational layers, meaning different involvement with the same outsourcing activity. The participants included two program managers, one lead service design, one product owner, a contract manager, an enterprise architect and the head of the contract management department. Recently a large IT outsourcing took place in the organization, focussing mainly on application development, infrastructure and architecture. The respondents and the case met the criteria described in the methodology, this allowed the case to be studied from different angles.

Table 7 gives an overview of the respondents. For more detail on the respondents, appendix 9, table IV gives a reflection their characteristics regarding their job function, view on outsourcing, opinion on the level of detail and whether they needed more information or explanation to understand the model and to be able to use the model in practice. This overview aims to give the reader a general impression of the respondents which should help to better interpret further data.

Table 7 respondents and their job function

#	Role in company and outsourcing
1	Product owner - Not involved in decision making, daily involvement in outsourcing activities
2	Program manager - Not involved in decision making, daily involvement in outsourcing activities
3	Program manager - Not involved in decision making, daily involvement in outsourcing activities
4	Enterprise architect - Not involved in decision making, daily involvement in outsourcing activities
5	Contract manager - Advisory role in outsourcing decisions
6	Lead service design - Advisory role in outsourcing decisions
7	Head of contract management - Involved in decision making

4.3 Data analysis

Seven interviews were recorded and transcribed, and subsequently analysed using RQDA. RQDA is a package for R studios, to structurally code the data. In accordance with the methodology, interview questions were first coded (open coding), for instance all responses to the interview question 'Are the terms used clear, what could be improved and why?' received the code 'TermsClear' and the explanatory answer received 'TermsClearWhy'. From this, axial coding could be performed. Amongst the code 'TermsClear' three answers were given (of course in different wording): 'Clear without explanations', 'Confusing/hard to tell' and 'With explanation'. These three answers formed the three axial codes to the interview question. Interview data is presented in this fashion in the next paragraph, 'clear without explanations' was answered by three respondents, 'Confusing/hard to tell' by another three respondents and 'With explanation' was mentioned by one respondent. These themes are substantiated with respondents' individual answers. These codes can be found in appendix 10. During the open coding step, 17 unique codes were found, during the axial coding step, 95 codes were found. To make data analysis easier, data was exported to Excel, to allow applying filters on the codes, to reveal relations between respondents' answers across various interview questions. For instance, the role of the participant in outsourcing decisions is compared with their views on the model, the level of detail, application and completeness.

4.4 Results regarding manageability of the model

This paragraph describes three interview questions of this research. Respondents were asked whether the terms used were clear, whether the model was complete and whether the level of detail was sufficient. Clarification questions led to substantiation of these answers.

4.4.1 Question 1: Are the terms used clear, what could be improved and why?

Seven responses were recorded, three respondents (4, 5, 7) indicated the terms are clear, another three respondents (2, 3, 6) needed explanation or more time to understand the model and found it confusing at first sight, one respondent (1) could only understand the model with explanations from the interviewer.

When asked to explain their answer, three respondents (4, 5, 7) indicate the terms used in the model are well known from what they know from practice and their daily involvement in outsourcing activities and helped them understand the model, *"these kinds of models we use in practice".* Although respondent 5 indicated the all terms are clear, he added that the terms used under infrastructure assets were difficult to understand and elaborated *"if we want to outsource office automation, the split of infra asset categories makes it hard to tell where this is placed exactly".* The three respondents who found the model confusing, all explained that the split between capabilities and assets made it difficult to understand the model. Additionally, respondent 6 said "*when you develop a matrix, you can't name elements on the X axis the same as on the Y axis, for instance applications".* Respondent 2 added "*the longer you work with the model, the*

easier it gets to understand it, but it is confusing at first sight". Respondent 3 added that the lack of business assets made it difficult to place the model in practice. The respondent who needed help to understand the model explained this was due to their own lack of knowledge and role in the company.

4.4.2 Question 2: Do you think the model is complete, what needs to be added, what can be removed, and why?

Three respondents indicated the model is complete (1, 2, 7), the other four respondents (3, 4, 5, 6) believe the model needs additions or changes. The respondents who believe the model is complete, explained this because they were able to plot all outsourcing activities on the model. Also, respondent 3 who believes the model needs additions agreed he was able to plot outsourcing activities on the model, but added that for different types of outsourcings, the model could need either less or more categories, depending on the complexity of the outsourcing. Respondent 7 added that in other models that are used in practice, the categories may be named differently, but all describe the same elements, "*I don't miss any categories, when you compare this model to other models, or for instance ITIL, categories have different names but amount to the same, using a good set of examples should therefore work better than focussing too much on the definitions"*

Respondent 3, 4, 5, and 6 mentioned the model needs additions. The initial reaction of respondent 3, 5 and 6 was that ITIL services and business aspects are missing from the model, "*I would start with adding the ITIL processes on the capabilities axis, they are now missing from the model and it is a well-known market standard".* Additionally, respondent 3 indicates "*The model describes the traditional IT organizations, but I miss the link with the business and policy, so policy makers and business coordinators*", and that in the current state, the categories do not represent the importance of the outsourcing activities "*why is IT vendor management only described in a single category while in our organization many employees work in this department? Why do other relatively small categories, such as innovation have three sub categories?".* Respondent 1 also mentioned this *"It would be useful if the number of FTE or costs could be described to add weight per category, the current layout makes representation of categories difficult".* Table 8 describes all mentioned additions or changes to the model.

Table 8 – an overview of all mentioned additions to the model

Category	Missing according to respondents	Respondent
Capability	Business	3, 4, 6
Capability	Services ITIL	3, 5, 6
Capability	IT personnel management	3
Capability	Middleware	4
Asset	CMDB	4
Capability	Database management	4
Capability	Data management	4
Capability	End user training should be split up in sub categories	6
Capability	IT Finance / Control	3
Capability	IT Vendor Management not representative, split up categories	4
Capability	Legal IT aspects	5
Asset	Office automation	4
Capability	Licence management	5
Asset	Infrastructure sub-category: logic	3
Capability	Portfoliomanagement	3
Capability	Project management department	5

Respondents believe some categories can't be outsourced and therefore should be removed from the model. Respondents 1, 2 and 4 propose that IT strategy can't be outsourced. Respondent 4 mentions "*in my experience IT strategy can't be outsourced, you can hire external knowledge to help develop a strategy, but no more than that".* Respondent 1 proposes that IT vendor management is also something that can't be outsourced "*in my experience you can't hire people that manage your outsourcings, you can outsource your business, but you remain in control of the activity".*

4.4.3 Question 3: Is the level of detail of the information sufficient, do you prefer a higher or lower level of detail, and why?

Respondents 4, 5 and 6 indicate the model needs more detail, which relates to their preference for the previous question about adding certain categories to the model. Respondent 5 says *"More detailed is always better, at a high level it is always possible for multiple interpretations"* and refers to the maturity of collaboration between parties "*If there is no cooperation yet, I want a detailed approach anyway, you can always scale-down detail in the future".* Respondent 5 also adds "*we have experienced how vendors can take advantage of a cooperation when contracts are drafted incomplete, or when parties misinterpret elements of the agreement".* Respondent 6 says *"You can never decide to outsource without describing in detail what you want, otherwise you will extract elements that implicitly determine what you do with all other elements".* Respondent 7 agrees that describing outsourcings in detail is important but did not indicate whether the current model needs more detail for this purpose *"before you decide to outsource, you need to describe in detail what you want so you can make better overall decisions, in general a lack of detail in your outsourcing documentation leads to vendors taking advantage".*

Respondents 2 and 4 believe the level of detail of the model should depend on the outsourcing situation and organization maturity, the model can either be more detailed or more abstract. Respondent 2 adds *"for our organization where there are a lot of legacy applications, the model would benefit from more detail, however if your organizations' applications are running in the cloud, the model would benefit from a higher level of abstraction"* and advices to have "*multiple versions of the model, depending on the maturity and complexity of the organization".* Respondent 3 believes the model contains too much detail and says, *"In practice, services are purchased as a whole (infrastructure), in fact we buy storage space per kilo and we don't bother about how the vendor delivers this"*. The respondent adds "*in this modern world we only care about uptime, bandwidth, and quick recovery from outages, we expect that vendors can deliver this and don't need us to decide how they should deliver this".* Respondent 1 believes the model has the right level of detail and adds *"adding detail would make the model too organization-specific, removing detail would make the model too abstract to work with"*.

In appendix 11, figure III displays a schematic representation of the answers given by the respondents about the preferred level of detail of the model in relation to their involvement to outsourcing decisions. In general, respondents involved in outsourcing decision making, stress the importance of a higher level of detail.

4.5 Results regarding utility of the model

This paragraph describes the responses of four interview questions. Respondents were asked whether they could think of a situation in which the model can be useful, and whether the model provides useful information in the activity of making outsourcing decisions. Respondents gave limited responses to the two final questions of the interview, whether the model with possible extensions can be useful and whether there are any other additions or comments regarding the

potential usefulness of the model. Most of these answers were a repeat of the answers to earlier questions and could therefore be included in these respective answers.

4.5.1 Question 4: Can you give an example of a situation in which the model can be useful?

Two dominant answers were given when asked for useful applications of the model. Six respondents (1, 2, 4, 5, 6, 7) indicated the model may provide useful insights about the current situation, *"You can use the model as a starting point to answer the question, what IT resources do we have now, and do we want to have these IT resources?"* followed by an analysis step *"Are any resources missing from our business model and do we want to develop or attain these?*". Respondents then said the model "*can be used to support decision making on which elements of the business you want to keep internally and which elements you want to outsource?*". Respondent 4 and referred to this as an architecture-scan, respondent 6 referred to this as an organization-scan.

A second major answer given by three respondents (2, 3, 5) was that the model could be used as a monitoring and assessment tool, *"describe the outsourcing agreement in the model at the start of the outsourcing, in about a year discuss the agreements with your outsourcing partner to determine whether there are any gaps and steer where necessary, at the end of the outsourcing agreement refer back to agreements made and services delivered and use this as input for a next outsourcing".*

Because the respondents that propose these applications for the model, indicated the model needs additions or changes, appendix 12, table V gives a schematic overview of the intended use of the model in relation with what respondents mentioned as an addition for completing the model.

Two other applications for the model were mentioned, respondent 1 proposes a commercial application where *"you go to a company to screen the current outsourcing situation and determine what currently is outsourced and what is performed internally in the company".* Respondent 1 also proposes the model can be used to assess and align the cooperation between multiple outsourcing parties for a single company, *"often multiple parties are hired to outsource different parts of a business, individually this is a challenge, but even more challenging is aligning these parties to one another".* The model can be used to determine *"who does what, which skills from which party is hired for which purpose".*

4.5.2 Question 5: Does the model provide information that can be useful in discussions and decisions regarding outsourcing?

All seven respondents expect the model will deliver useful information in an outsourcing decision. The type of information however varies between respondents. Respondents 1, 5 and 7 propose the model could give useful insight in determining a companies' outsourcing policy. Respondent 7 says "*the model can objectify the outsourcing decision, as this is usually a rather biased process. By filling in this model you make clear what you want, what it should cost and who is the best party to do this".* Respondent 7 also mentions that this model gives a clear overview to convince other decision makers in the company, having all the facts in a single place. Respondent 7 proposes the model is exceptionally useful to prepare the "go-to-market" proposal. "*Often companies make a request in the market, it is useful if the market understands what are we talking about? Nice that you have your visions but what do we get thrown in our laps? The more specified your market request is, the better can suppliers estimate and provide a realistic quotation for what you want".* Consequently, says respondent 7 "*the information you collect to specify your market offer is very useful later during your bid phase".* Respondent 6 adds *"any model that helps to map complexity can be very useful, it helps you get the thought process going and provides clarity"*

5. Discussion, conclusions and recommendations

5.1 Discussion

With this study we developed a model to identify IT capabilities and assets in an IT outsourcing context. Although little previous scholarship on IT outsourcing frameworks containing IT assets, capabilities was identified, we combined the input of seven literature studies focusing on different aspects of IT outsourcing to make a first version of the model. We made a first attempt to validate this model by asking participants to relate actual outsourcing activities to the model and ask follow-up questions relating to the clarity of terms used, the completeness of the model, the amount of detail preferred in the model, useful applications of the model and useful information that the model provides in outsourcing decisions. The participants were able to plot their outsourcing activities on the model, they also indicated room for improvement and proposed different usages.

Literature study and model development

In the literature study of this study, six IT capabilities were identified; infrastructure, behavioral, business, technical, functional and organizational and management practice. In the developed model, these capabilities were used, however due to the amount of other IT capabilities that were identified in other literature studies, they were assimilated in different categories. The infrastructure capability is found in the model but was divided in sub-categories. Behavioral, business and technical capabilities were respectively assimilated in HRM, Strategy, and Infrastructure. Functional and organizational capabilities and management practice capabilities were respectively assimilated in Strategy and HRM. The same was done for the three IT assets that were identified; core communication, enterprise computing and group collaboration technology. These assets all describe various aspects of what in the model became the asset 'communication- and collaboration technology', the assets identified in this study are a subdivision of this.

As opposed to the identified literature in this study, the developed model contains a higher level of detail, with more sub-categories for the identified capabilities and assets. Notably, where this study only identified assets that fall under communication- and collaboration technology, the developed model contains other assets, such as infrastructure, applications and data (analytics output). Based on the collected data, having more categories and sub-categories for the assets and capabilities proved beneficial, since respondents indicated that they want to add even more categories to the model. The assets and capabilities identified in this study are described on an abstract level, whereas the assets and capabilities in the model represent categories that can be related to actual business aspects, for instance architecture, applications or infrastructure. Based on the collected data this was a good choice. At least half of the respondents indicated they had trouble understanding the model and definitions in its current state. If the categories used in the model would have been on a more abstract level, there would have been a chance the respondents had even more difficulty to understand the model.

A limitation to the development of the model is the diversity of definitions that are used for IT assets and capabilities and the lack of uniformity of the model. We did not systematically review the literature; therefore, we cannot assume to be complete. In addition, during the development finalization, the model was divided over the seven researchers, which had their own view on for instance the number of sub-categories and formulation of the definitions. There were no generic agreements on this, which led to a model that could be regarded as inconsistent. Even though we reviewed each other's work, in the final model it becomes clear there is still some room for improvement regarding consistency of the number of sub-categories and definitions used. This can

be linked to the respondent's answers that some categories are described with many sub-categories, for instance innovation capabilities, whereas for the case organization IT vendor management represented a much higher volume and responsibility but had no sub-categories. An improvement could be to keep in mind the importance or business volume of the categories in the model when forming the sub-categories. This is also confirmed by respondents proposing to rename the categories with the same name, for instance application assets and capabilities, to make the model less confusing. In addition, during the interviews we noticed giving examples worked better than discussing definitions, which may indicate room to improve the presentation of the model in terms of (sub-)categories, definitions and examples.

Conducting interviews

A limitation to be considered is that the study relies mostly on a small number of interviews in a single case organization. Also, we had to ask informants about events that had occurred in some cases several years earlier. An improvement would be to do a multiple case study, with a focus on respondents that work on a daily base with recent outsourcing activities, to allow extrapolation of the current findings. Some level of socially desirable answering is implied, for instance because the respondents answered that they thought the model to be complete, but once they were asked why, a majority of respondents started naming categories to add to or remove from the model. An advantage of semi-structured interviews in exploratory research, compared to structured interviewing, is that we had more freedom to ask follow-up or explanatory questions, and had the opportunity to establish personal contact (Saunders et al., 2015) to increase reliability of the answers.

Biased by profession

In interpreting the results, bias by profession should be considered, specifically decision makers and respondents that are closely involved in outsourcing decision makers may feel they need to convince the interviewer that they know their line of business well and approve the use of our developed model.

Outsourcings plotted on the model

During the interview, respondents were asked to plot the outsourcing activities on the model, which led to the presented heatmap in the previous chapter. Not only did this confirm respondents' later answers that the outsourcing was mainly focused on infrastructure, architecture and applications, it gave a first validation that respondents were able to work with the model and plot actual outsourcings on it. If the categories plotted on the model show a lot of variation from the outsourcings that were discussed during the same interview, it could indicate the model is unable to capture this. Although a follow-up study is advised covering various types of outsourcings and multiple organizations, this is a first indication of the model's usefulness.

To improve external validity more research is needed with a higher number of respondents and a variety of cases. The case we used impacts the variety of answers given. When presenting this model in for instance a tech start-up, it is likely other assets and capabilities are discussed, for instance data analytics, big data and real-time monitoring. Also, the type of outsourcing is a determinant, if the outsourcing is limited to infrastructure, responses in different categories are less likely.

Question 1: Are the terms used clear, what could be improved and why?

Respondents that are involved on a daily base with outsourcing decision making appear to be better able to understand the model and used terms, as opposed to respondents that are less involved in outsourcing decision making. The model is recognized from practice and shows overlap with other models that are used. Respondents that have difficulty to understand the model, indicate this is due to their lack of knowledge, or find the split between assets/capabilities confusing. They do agree that the longer you work with the model, the easier it becomes to understand. In interpreting the results and determining follow-up research it should be considered that there is some degree of variation amongst respondents as opposed to whether the terms are clear, and therefore it should be considered to which audience the model is presented.

Question 2: Do you think the model is complete, what needs to be added, what can be removed, and why?

Three respondents propose the addition of ITIL services and business to the model. Not only do they believe adding these aspects would allow outsourcings to better fit in the model, they think this is a well-known market standard and would improve recognizability of the model. Removing strategy capabilities and IT vendor management should be considered, as multiple respondents believe these are categories that can't be outsourced. Although follow-up research is proposed to further investigate these alterations to the model, some existing literature regarding the topic ITIL in outsourcing and Business-IT outsourcing was found.

The addition of ITIL in the model contrasts with the study where Alojail, M. et al., (2016) finds in a survey with 140 users that the adoption of ITIL in outsourcing yields similar outcomes as compared to outsourcings where ITIL had not been implemented. The study also indicates that the focus on ITIL within-firm service delivery makes it a less helpful as a strategy for managing externally provided IT services. In a different two-year multi-study, Alojail, M. et al., (2014) proposes that the extent to which the client and vender understand each other's expectation is crucial to using ITIL effectively. Therefore, adding ITIL categories in our model as a basis to determine outsourcing activities, does not necessarily lead to an improved usefulness of the model.

Respondents indicated that business aspects are missing from the model, hypothesizing that IT outsourcing impacts business aspects. In a study, Willcocks, L. et al., (2004) developed a model for evaluating the knowledge potential within outsourcing arrangements, indicating that outsourcing IT and business processes together is a way to establish enterprise partnerships and create social capital. Lacity, M. et al., (2009) propose that looking at outsourcing from a business process point of view, yields a higher potential success than looking at solely IT process outsourcing, also indicating that adding business aspects to the model could add value. Because this model was developed from an IT point of view, it should be considered that the usefulness could increase when business categories are added.

Question 3: Is the level of detail of the information sufficient, do you prefer a higher or lower level of detail, and why?

Our study gives an indication that the extent to which a respondent is involved on a daily base with outsourcing decision making affects the degree of detail they expect from the model. The higher the involvement of the respondent in outsourcing decisions, the more detail is preferred. Respondents nuance that the maturity of a cooperation between a company and an outsourcing vendor, determines the level of detail the model needs, an existing relation between companies requires less detail. Also, the complexity of the outsourcing and which parts are to be outsourced

appear to be a determinant for the level of detail that is needed. Respondents indicated that adding more detail to the model can prevent misinterpretation of definitions, but also prevents the vendor from taking advantage of the agreement. Respondents indicate that additional complexity is added when multiple outsourcing parties are involved, especially when multiple parties need to be aligned. Respondents who are less involved in outsourcing decision making believe the model in its current state is the right level of detail, or could be less detailed, because modern organizations perform outsourcings on a more abstract level. Detail in outsourcing is discussed in existing literature, for instance Sako (2010) proposes an optimal degree of detail in outsourcing decisions depends on the task at hand. Which appears in line with the findings of our study. In addition, Susarla et al., (2010) proposes a holdup problem, where complexity and scope of outsourced information technology (IT) demands relationship-specific investments from vendors, which, when combined with contract incompleteness, may result in underinvestment and inefficient bargaining. This is in line with our respondents that indicate the possibility of vendors taking advantage of an outsourcing situation when contracts are incomplete. Some studies underline this, for instance Poppo et al., (2002) proposes higher level of detail in outsourcing leads to significantly higher levels of IT outsourcing success. Also, Lacity et al., (2009) stipulates the importance of usage of clear definitions and detail, which is supported in their review on IT outsourcing literature. The level of detail of the model should be considered when using it in follow-up research, based on our study results and existing literature, it is likely to assume that finding the right level of detail is an important aspect of successful outsourcing decision making.

Question 4: Can you give an example of a situation in which the model can be useful?

Two potential usages to the model were dominantly mentioned, using the model as an internal analysis tool and using the model as an outsourcing monitoring tool. As outsourcing leads to changes in the management process, the need arises to monitor quality of service. This is even more complicated when only parts of IT are outsourced. For internal analysis, various tools have been developed in the past specifically for this aim for instance architecture frameworks, which are perhaps therefore better suitable than our framework which was developed from an outsourcing perspective. However, according to respondents there appears to be a need for gathering information before making outsourcing decisions. Often mentioned by respondents is that they doubt whether companies are aware of all their current IT resources, and whether they make decisions based on this knowledge. At the same time, respondents have discussed the discrepancy between ‘what was agreed with a vendor’ and ‘what was delivered by a vendor’ and based on this believe the model could prove a good monitoring tool. It must be considered that the current outsourcing situation in the case organization leads to these two preferred usages of the model. If outsourcing agreements were well described and maintained, the need for analysis and monitoring could be lower and other preferences would have been given by respondents. Therefore, it is an interesting consideration for the study results and further research that there can be more useful applications of the model.

Question 5: Does the model provide information that can be useful in discussions and decisions regarding outsourcing?

All seven respondents expect the model will deliver useful information in an outsourcing decision. The type of information however varies between respondents. This study shows the model can be used to prepare outsourcing decision making, by objectively analyzing the current situation and let practitioners decide what they want to outsource and what not. This creates a concrete market proposal that can provide value in later phases of outsourcing. The model can also be used as an evaluation of the cooperation with IT service providers, enabling practitioners to prioritize IT gaps

within their company. The model can have various commercial applications and can help aligning multiple outsourcing parties. It should, in follow-up research, be considered with what intended purpose the model is developed and evaluated, it should also be kept in mind, different versions of the model can be developed with their own applications.

Additional unintended finding

Although no interview questions were asked on the ratio between internal and external outsourcing activities, it was mentioned by five respondents that outsourcing business processes always concerns a "*part that remains internally and a part that is outsourced".* This ratio is now not visible in the model and could be of importance to add in a new version. Respondents added that some activities can never be completely outsourced, for example the vendor management capability was mentioned by two respondents, here to some degree knowledge and consulting can be hired, but no more than that. "*How can you manage outsourcings if all outsourcing capabilities are outsourced?"* Therefore, in further development of this model, the possibility arises that some aspects cannot or only partially be outsourced.

5.2 Conclusions

For the developed model we identified IT assets and capabilities and structured these in a validated framework. Keeping in mind the limitations, this case study enabled seven actual outsourcings in the framework leading to the conclusion that the model appeared useful in practice. Two practical applications were identified, including an internal analysis tool and a monitoring tool. Setting the recommendations against intended use of the model, involvement in outsourcing decisions and preferred level of detail, indicated several improvements and directions for future research. Working on a daily base or being directly involved in outsourcing decision making, leads to a preference of higher level of detail than our current model. For understanding the model categories, providing a good set of examples worked better than the set of definitions established, because other models use different definitions but refer to the same things. The model is able to provide insight in assets and capabilities that are outsourced in combination, which provides cause for follow-up research. Although the model was designed from an IT perspective, adding business aspects is a recommendation which is in line with current literature.

5.3 Recommendations for practice

Although respondents propose there is room for improving the model, they all acknowledge the usefulness of the model, as a tool for internal analysis of the current situation, to help make sound outsourcing decisions and a monitoring tool which can be used during the actual outsourcing.

Managers and decision makers in outsourcing process can use this model as a tool to get the thought process started on what aspects can be outsourced, how what is currently outsourced and what in an ideal situation they want to outsource. It can help draft or clarify existing outsourcing policies, and for companies to keep a structured overview of their IT resources. Many respondents view outsourcing as highly complex, this model helps to reduce complexity and help managers in their decision making.

5.4 Recommendations for further research

An indication was discovered about coherence in level of involvement in outsourcing activities relating to the intended use of the model and preferred detail. The relation between these aspects is an interesting follow-up research.

The relations of assets and capabilities that were plotted on the model could be used for follow-up research. A first attempt was made to compare the responses to the model with the identified relations in the literature study of this research in appendix 8, which should be considered as a proposal for what such follow-up study may look like. Follow-up research should include using other case organizations and a more systematic review of the literature. Relations can be empirically tested using the developed model, preferably with a large dataset and a variety of case organizations. The collected data can be used to perform a factor analysis and reduce the models' dimensions, giving categories weight and identifying underlying coherences. Factor analysis is a statistic analysis of variability among observed variables and unobserved factors that explain correlation. In addition, only clients were included in this case study, the inclusion of vendors could yield valuable insights. This should lead to a model with identified relations from the literature study and a model with responses from various cases and respondents, subsequently an analysis could be performed whether there is overlap between the identified relations and respondents' answers.

A new version of the model could be developed including business aspects and excluding aspects that can't be outsourced and tested for its usefulness and manageability. Also, different organizations would need either a more abstract or detailed model depending on the organization maturity. It would be interesting to test various models in organizations ranging from start-ups to more mature organizations and discover whether on what level they prefer to discuss outsourcings. External validity can be increased by using broad-inclusion criteria that results in study cases that more closely resembles the diversity in organizations.

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Appendix 1 card sorting

An advantage of open card sorting, if done by multiple persons, is that it is a relatively objective way to process data. Although there is no minimum number of people prescribed that should participate in a card sorting session to obtain an objective result, between 4 and 20 participants should be aimed for (Paul, 2008). Performing this session with all seven research practitioners and a facilitator should give a result of sufficient quality. All participants should be well informed about the topic, this is result is sustained by the fact that all participants are researching the same topic. A facilitator should be able to oversee the card sorting process and involve all participants. Dominant participants can endanger the objectiveness of the outcome, as such participant may try to convince others to follow his or her opinions (Spencer, 2009). Therefor it is discussed beforehand that every participant should give everybody enough room to give their input. The facilitator will intervene if needed to maintain balance. Finally, the card sorting session can be performed in three ways; together, in parallel or in sequence. A sequence card sorting session may lead to a biased result based on the order of participants in the session. The first participant may influence the rest, the last participant may influence the result as well. A card sorting session together should lead to the most consensus between all participants as the results are constantly discussed together and is regarded as a highly efficient approach (Paul, 2008), because of this a session together is preferred. The session will be held according to a Metaplan (Howard, 1994), which means there will be a common goal (categorize the identified IT assets, IT capabilities and relations) and standard equipment will be present (all identified definitions printed out on single pieces of paper as large index cards so that they can be read from far away, post-it notes with pens for writing new categories on, a large table to sort the cards on, chairs to form a circle around the facilitator). The session will be held as follows:

Part 1:

- The facilitator shows the first index card and places it on the table;
- The facilitator shows the second index card and asks whether this falls under the same category as the first, or falls under a new category;
- In case a card can't initially be placed under a category, it may be placed under a stack that is discussed again at the end of the session;
- These steps are repeated until all index cards are placed.

Part 2:

- A discussion is held of maximum 2 minutes over categories that were formed but are too large or has several subtopics under it;
- Cards are attempted to be rearranged or new categories are formed;
- Repeat these steps until all categories are of equal level of abstraction and size (i.e. none have subcategories) and are exhaustive, mutually exclusive, sensitizing and conceptually congruent (Merriam, 2009).

Part 3:

- Name the categories, either derived from a card in the category or a new name that covers the category completely;
- The group shouts out these names until a group approves of a single name.

Appendix 2 initial theoretical framework

Table I: summary of IT capabilities, assets and identified relations in the initial literature study

	IT Infrastructure capability	Behavioural capability	Business capability	Technical capability	IT functional and organizational capability	IT Management practice and employee empowerment
Core communication technology	R_2 + R_3 +				R_2 +	R_2 +
Enterprise computing technology	R_2 +				R_1 + R_2 +	R_2 +
Group collaboration technology	R_2 +				R_2 +	R_2 +

Appendix 3 Interview protocol

Example

Main question: Give an example of a previously made outsourcing decision in which you have been involved
Additional questions:

a. Indicate when the case was going on, why was outsourcing considered, which organizational units were involved, how did the process of reaching the decision go, what information was available for taking the decision, what decision was taken, how did the decision turn out in practice, what impact did the decision have on matters that were not outsourced, does the organization now have trouble or ease of decision.
b. Is it possible to indicate in the model which (combinations of) IT capabilities and assets were involved in the case?

Intended result: Reliving the situation when preparing the interview and at the start of the interview so that the interviewee and the researcher have the same starting situation and can relate this to the model.
Preparation: This question has already been included in the invitation to the interview.

Structure
Main question: "is the model manageable".
Additional questions:

a. Are the terms used clear, what could be improved and why?
b. Do you think the model is complete, what needs to be added, what can be removed, and why?
c. Is the level of detail of the information sufficient, do you prefer a higher or lower level of detail, and why (yes / no)?

Intended result: The vision of the interviewee on the manageability of the model.

Usefulness
Main question: "In which way and why can the model be useful in policy, process and decisions with regard to outsourcing".
Additional questions:

a. Can you give an example of a situation in which the model can be useful?
b. Does the model provide information that can be useful in discussions and decisions regarding outsourcing?
    a. If so, which and why?
c. Can the model with possible extensions be useful?
    a. If so, which and why?
d. Do you have any other additions or comments regarding the potential usefulness of such a model?

Intended result: The vision of the interviewee on how the model can be useful for outsource decisions.

Appendix 4 Interview protocol elaboration

Reflection on interview protocol

Introduction (10 minutes) – the interviewer and interviewee start by introducing themselves to feel at ease, discuss practicalities and introduce the topic of the research. Stating the duration and purpose of the interview is an attempt to reduce bias, the interviewee will know what lies ahead and can mentally prepare for that.

1. Relive recent outsourcing (10 minutes)

The interviewee is asked to place in context a recent outsourcing in the presented model. Simultaneously, the interviewee is asked to tell about this outsourcing, how it went, what the involvement was and what could have gone better. Talking about an actual outsourcing event is known as a critical incident technique (Saunders et al., 2015). By doing this, an attempt is made to increase the reliability of their answers because the interviewee is talking from their personal experiences. Validation of the model would be possible of interviewees are consistently able to plot real-life scenarios in the model. This also sets a basis for the rest of the interview.

2. Questions on manageability of the model (15 minutes)

Three questions are discussed, whether the model is clear to understand in terms of definitions, whether the model is complete and whether the level of detail is enough. These questions are each time followed by a 'why' question to get qualitative results. In this section, a view on the manageability of the model is established.

3. Questions on usefulness of the model (20 minutes)

Four questions in this section should give insight in whether the model is useful and what practical applications the respondent thinks it has. Two questions on what information the respondent believes the model gives, and whether additions to the model are useful, have follow up questions. The aim is to have an in-depth discussion on the usefulness of the model.

Finalization (5 minutes) – the interview is finalized, and the participant is reassured their answers are handled anonymously and conscientiously.

Appendix 5 data coding approach

Open coding

- All data is grouped according to the interview protocol section. Most importantly will be the data from sections 3 and 4, the outcomes from these questions will be used for the validation of the model and determining its usefulness. Specifically, the 'why' questions should provide insights for answering the research questions.
- Per section, the data from all interviewees is read
- Starting with the first answer, a category is attempted to be formulated (in vivo for the answers regarding the usefulness of the model) or placed under existing categories (a priori for the answers regarding the completeness of the model, i.e. the IT assets and IT capabilities)
- Repeat these steps until all data is processed
- Review the data

Axial coding

- Review the codes derived from the open coding
- Look for recurring information, what seems to be important and what patterns/trends are evident
- Develop themes based on these patterns and trends and see if underlying codes appear to be related
- Perform a critical review of the formed themes by asking what the essence of the theme may be, how they may relate to each other, whether there is an overarching theme and the thematic representation is applicable to the research question of this study
- Consider recoding the data if needed

Appendix 6 developed framework

IT CAPABILITY \ IT ASSET		Data	Applications	Infrastructure				Communication Systems	Data analytics output
				Data centre	Hardware	Network	Software		
Strategy formation	Develop								
	Execute								
Innovation	Anticipation								
	Process innovation								
	Product innovation								
	Technology application								
Security									
IT Vendor management									
IT Processes	Development								
	Implementation								
	Maintenance								
HRM (IT Staff)									
End user training									
Architecture	Planning								
	Implementation								
	Maintenance								
	Management								
Infrastructure	Planning								
	Implementation								
	Maintenance								
	Management								
Applications	Develop								
	Implement								
	Maintain								
	Manage								
Monitoring									
Data Analytics									

Figure I – developed framework of IT assets and capabilities

Appendix 7 overview of identified assets and capabilities, definitions and examples

Table II Identified IT capabilities, sub categories, definitions, examples and sources

Category	Sub category	Definition	Examples	Reference
Strategy formation	▪ Develop strategy ▪ Execute strategy	The ability to understand business, develop and execute a vision on Business/IT strategy and manage internal and external relationships	Project Planning, Capacity to manage IT change, Business and IT vision	Wade, M., & Hulland, J. (2004). Ravarini, A. (2010 Piccoli, G., & Ives, B. (2005)
Innovation	▪ Anticipation ▪ Process innovation ▪ Product innovation ▪ Technology application	The ability to identify, anticipate on emerging technologies and transform into product and process innovations	IT research and development, experimentation with new technologies, ability to convert IT assets into innovations	Fink, L., & Neumann, S. (2007) Ravarini, A. (2010)
Security		The ability to implement security, disasters planning and business recovery service for firm-wide installations and applications	Infrastructure and application security, penetration test, security management	Ravarini, A. (2010)
IT vendor management	▪ IT vendor management	The ability to understand and manage cost of acquisition, determine supply sourcing options, and develop and maintain relationships with IS/IT service suppliers	Contract monitoring, Purchase of application software Vendor development	Ravarini, A. (2010) Wade, M., & Hulland, J. (2004)
IT processes	▪ Development ▪ Implementation ▪ Maintenance	The ability to create, implement and maintain IT processes that support IT developments	IT processes (lean, six sigma), project management, governance	Molla, A., & Cooper, V. (2010) Wade, M., & Hulland, J. (2004) Aral, S. , & Weill, P. (2007)
HRM (IT staff)		Developing and managing the IT human resource	Leadership, quality of workforce, development of skills	Willcocks, L. P., & Feeny, D. (2006) Harvey, M., & Lusch, R. (1997) Eldin, A., Ali, A., & Al-Tit, A. (2016)
End user training		The ability to train end users of IT systems	Training, guidance of employees in change	Cruijssen, F., Dullaert, W., & Fleuren, H. (2007), Ravarini, A (2010)
Architecture	▪ Planning ▪ Implementation ▪ Maintenance ▪ Management	The ability to develop and uphold architecture principles, overseeing the integration of multiple systems	Architecture planning, application life cycles, administration of CMDB	Wade, M. & Hulland, J. (2004) Melville, N., Kraemer, K., & Gurbaxani, V. (2004)
Infrastructure	▪ Planning ▪ Implementation ▪ Maintenance ▪ Management	The ability to develop, plan and manage firm-wide hardware, facilities, middleware and software	Network management, data centre management, middleware management, software management, device management	Ravarini, A. (2010) Pavlicek, A. (2013) Dahiya, D., & Mathews, S. K. (2018)

Applications	▪ Development ▪ Implementation ▪ Maintenance ▪ Management	The ability to develop and deploy IT applications that support business users	Application development and testing, design and business alignment and deployment	Cheon, M. J., Grover, V., & Teng, J. T. C. (1995) Ravarini, A. (2010)
Monitoring		The ability to monitor in real time the current state of IT applications, performance and disruptions	Real time monitoring, performance measurement, deviation detection	Aral, S. , & Weill, P. (2007) Amaral, J., Billington, C.A., & Tsay, A.A. (2006)
Data analytics		The ability to leverage digital data to explore new business opportunities	Data management, data structuring, ETL, reporting, visualisation	Shuradze, G., & Wagner, H. T. (2016)

Table III Identified IT assets, sub categories, definitions, examples and sources

Category	**Sub category**	**Definition**	**Examples**	**Reference**
Data		Possession of information repositories that collect and store company data which may be used for analytics	Databases, data model, terminals, customer data, business data	Piccoli, G., &Ives, B (2005) Yoon, C.Y. (2011)
Applications		Possession of IT solutions, applications and systems that support end users in their daily activities	ERP/SCM, SAP, Business applications,	Yoon, C.Y. (2011) Aral, S., & Weill, P. (2007) Melville, N., Kraemer, K., & Gurbaxani, V. (2004)
Infrastructure	▪ Facilities ▪ Hardware ▪ Network ▪ Software (middleware)	The base foundation of the IT portfolio (including both technical and human assets), shared through the firm in the form of reliable services.	Data centre, connectivity, hardware, storage, cloud, devices	Piccoli, G., & Ives, B. (2005)
Communication- and cooperation systems		The possession of communication technology that allows employees to effectively communicate and cooperate	Email, communication technology, dashboards, ticketing systems	Aral, S., & Weill, P. (2007) Eldin, A., Ali, A., & Al-Tit, A. (2016)
Data analytics output		Possession of knowledge and information, i.e. business intelligence, with or without tools, models and algorithms that leads to insight that can be used for a competitive advantage	Business intelligence, AI, dashboards, statistic models, algorithms	Nuñez, D. L., & Borsato, M. (2018) Fink, L., & Neumann, S. (2007)

Appendix 8 aggregated view of respondents' answers and identified relations in literature study

Study results

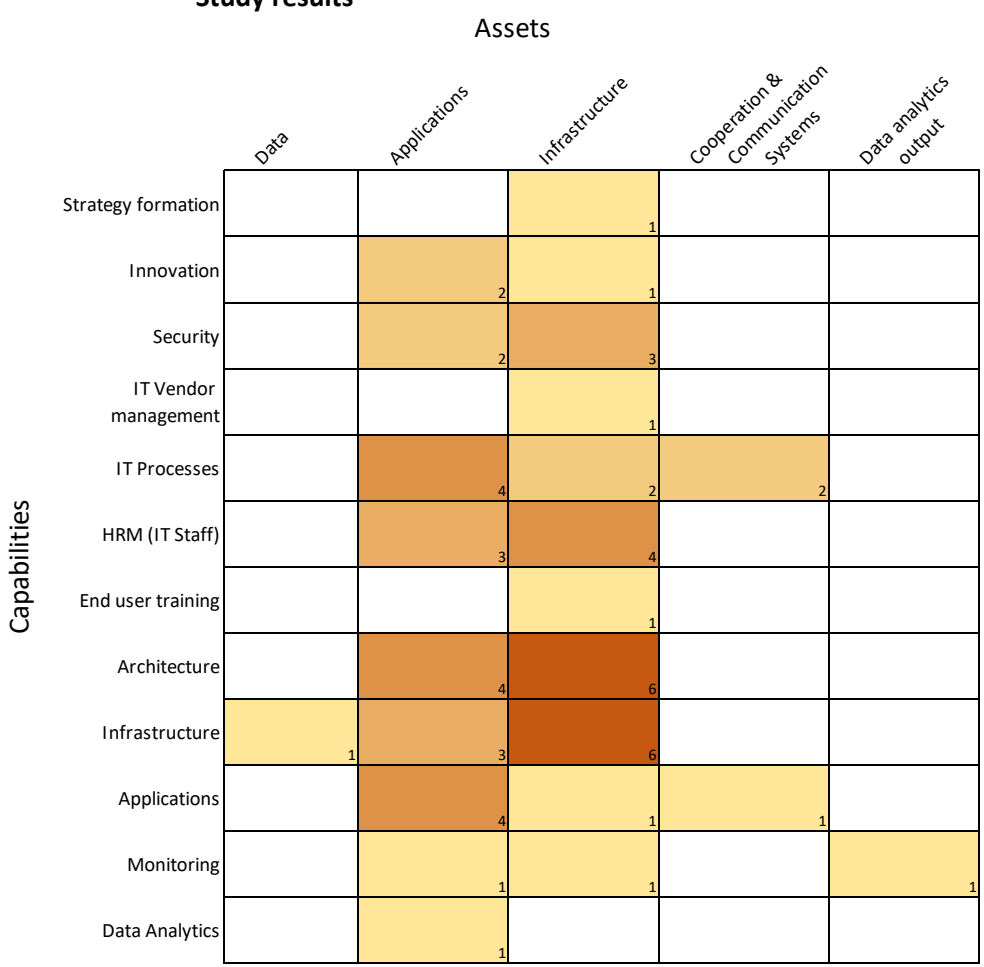

Figure IIa - a graphical display of the developed model including the respondent's answers

Figure IIb - a graphical display of the identified relations in the literature study relative to the respondent's answers

This appendix should be considered a proposal for follow-up research. Figure IIa displays which capabilities and assets were filled in based on actual outsourcings in the interviewees' organization, in an aggregated way. The heatmap should be made including multiple studies from other case organizations. The number and shade of the colour in the model corresponds to the number of affirmative relations between assets and capabilities. In our findings for instance, six participants mentioned in an outsourcing a coherence between architecture capabilities in combination with Infrastructure assets. Also mentioned six times was the coherence between infrastructure capabilities and assets. Mentioned four times were the combination of application assets with IT processes, architecture and application capabilities.

Figure IIb reflects relations between assets and capabilities as identified in the literature study of this research. Performing a systematic review could reveal other relations. When the relation was mentioned 0 times, the category is red, an orange colour indicates the relation was mentioned a maximum of 2 times. A green colour indicates the relation was mentioned 3 times or more. Overlap between figure 1a and 1b becomes evident for the following coherences: IT process capabilities and applications assets, and infrastructure capabilities and infrastructure assets.

Appendix 9 overview of respondents

Table IV – an overview of respondents and their characteristics

#	Role in company	Type of involvement with outsourcing activities	Perception of outsourcing	Proposed purpose of model	Preferred level of detail of outsourcing model	Explanation for level of detail	Explanation needed to understand the model
1	Product owner	Not involved in decision, occasionally involved in daily activities	All IT should be outsourced	▪ Internal analysis of current situation to prepare for outsourcing ▪ Comparison between outsourcing partners "who does what?" ▪ As a commercial tool to asses other organisations	As current state of the model	More details are too organization-specific, less details makes the model too abstract to work with in practice	Additional explanation is needed, specifically the split between assets and capabilities
2	Program manager	Not involved in decision, occasionally involved in daily activities	All IT should be outsourced	▪ To determine the gap between what was initially outsourced versus what outsourcing activities were delivered ▪ As an input method for future outsourcings ▪ Internal analysis of current situation to prepare for outsourcing	Current state, but depending on the maturity of organizations	There is never enough detail in outsourcings, however a more mature organization allows for more abstract overviews	Complex to understand at a first glance, specifically the split between assets and capabilities. I need more time to familiarize myself with the model
3	Program manager	Not involved in decision, occasionally involved in daily activities	Specific IT should be outsourced to focus on core business activities	▪ To determine the gap between what was initially outsourced versus what outsourcing activities were delivered	Preferably more abstract, less detailed	In practice organizations want to outsource chunks of their business, and not go in to detail	Complex to understand at a first glance, specifically the split between assets and capabilities, also the business (non-IT) aspects are missing but are essential
4	Enterprise architect	Not involved in decision, occasionally involved in daily activities	Specific IT should be outsourced to focus on core business activities	▪ Internal analysis of current situation to prepare for outsourcing ▪ A more comprehensive model would be more suitable	Current state, but depending on the maturity of organizations	It depends on your organization, but it's likely you require more detail	Well known models from an architecture perspective
5	Contract manager 1 Contract manager 2	Direct advisory role in outsourcing decisions	Specific IT should be outsourced to focus on core business activities	▪ Internal analysis of current situation to prepare for outsourcing ▪ To determine the gap between what was initially outsourced versus what outsourcing activities were delivered	Preferably more detailed	More detail is preferred to prevent wrong interpretations of definitions, however too many details may make outsourcing unnecessarily complex	Fully understandable from a contract management perspective, similar models used in practice
6	Director service design	Direct advisory role in outsourcing decisions	All IT should be outsourced	▪ Internal analysis of current situation to prepare for outsourcing	Preferably more detailed	You can't decide to outsource without describing in detail what you want. Otherwise you miss out important details that affect other parts of your business	Complex to understand at a first glance
7	Head of contract management	Making outsourcing decisions	Outsourcing in compliance to EU outsourcing legislations	▪ Internal analysis of current situation to prepare for outsourcing ▪ To improve illustration of what a company wants to outsource	Preferably more detailed	The assumption is that IT can be outsourced as commodities, no details needed. However, when going through the process, more details are needed to define the cooperation between parties	Well known type of model from a contract management perspective

Appendix 10 data coding

Part of interview	Interview question	code (open)	code (axial)	Count
Introduction	Can you state your name and role in the company?	RoleRespondent	Contract manager	1
			Enterprise architect	1
			Head of contract management	1
			Lead service design	1
			Product owner	1
			Program manager	2
Introduction	We are here in context of my thesis on outsourcing, does this play a role within your company?	OutsourcingPolicy	All IT is outsourced	2
			Specific IT is outsourced, focus on core business	2
			Subject to EU outsourcing policy	1
Introduction	Were you involved in an outsourcing decision?	InvolvedOutsourcingDecision	Advisory role in outsourcing decisions	2
			Involved in decision making	1
			Not involved in decision making, daily involvement in outsourcing	4
Manageability	Are the terms used clear?	TermsClear	Clear without explanations	3
			Confusing/hard to tell	3
			With explanations	1
Manageability	What could be improved and why?	TermsClearWhy	Definition infra unclear	1
			Due to missing business aspects	1
			Due to my own lack of knowledge	1
			Due to split in model	3
			Known from practice	3
Manageability	Do you think the model is complete?	ModelComplete	No, categories not representative	1
			With additions	3
			Yes, complete	3
Manageability	What needs to be added, what can be removed?	ModelCompleteAdditions	Asset CMDB	1
			Asset infrastructure sub-category logic	1
			Asset office automation	1
			Capability business	3
			Capability data management	1
			Capability database management	1
			Capability end user training to be split up	1
			Capability IT finance / Control	1
			Capability IT personnel management	1
			Capability IT vendor management	1
			Capability legal IT aspects	1
			Capability licence management	1
			Capability middleware	1
			Capability portfoliomanagement	1
			Capability project management department	1
			Capability security to be split up	1
			Complete, matches other models	1
			ITIL	3
Manageability	Why?	ModelCompleteWhy	Can plot outsourcing in model	4
			Depends on allotment	1
			No, categories not representative	1
			Not complete, additions	3
Manageability	Is the level of detail of the information sufficient?	DetailSufficient	Depending on the situation, more abstract or more detailed	2
			More abstract	1
			Preferably more detail	4
			Yes, right level of detail	1
Manageability	Why?	DetailSufficientWhy	Further split of categories depends on organization (legacy) modern organizations benefit from a more abstract model	2
			More detail prevents misinterpretation	1
			Too much detail too organization-specific, less detail is too abstract	1
			Too much detail, outsourcing in commodities	1

			You need to describe in detail what you want	2
Manageability	Do you prefer a lower or higher level of detail?	DetailOrHighlevel	Depends on technical design	2
			Abstract agreements suffice (assumption), detailed agreements needed (practice)	3
			High level of detail, GB/eur, usually in modern companies	1
Usefulness	Can you give an example of a situation in which the model can be useful?	UsefulSituation	Commercial application	1
			Comparison between two parties, who does what?	1
			Determine difference between what was agreed and what is delivered (monitoring)	3
			Input for next outsourcing	1
			Internal analysis, what internally what externally	6
			Not useful in agile world (too much documentation)	1
Usefulness	Does the model provide information that can be useful in discussions and decisions regarding outsourcing?	InformationUseful	Yes	7
Usefulness	If so, which and why?	InformationUsefulWhy	Helps to identify complexity	1
			Objectification outsourcing, who does what (between parties)	1
			Preparation for market outsourcing request	1
			Start, monitoring, input following outsourcing	4
			Substantiation discussion of hiring policy	3
Usefulness	Can the model with possible extensions be useful?	ExtensionsUseful	No, make it more simple instead of more detailed	1
			Yes	4
			Add ITIL	1
			Benchmarking	1
			Different versions for different stakeholders	1
			Financial insights, return on investments	1
			Licencemanagement	1
			Provide insight in who does what (2 parties)	1
Usefulness	Do you have other additions or comments regarding the potential usefulness of such a model?	AdditionsCommentsModel	Provide insight in what is done internally and what externally	1
			To check whether you are in control of your outsourcing	1
			Use model for organization scan, provide insight in cost and FTE	1
Other	Other	InternalExternal	InternalExternal	2
Other	Other	RelationModel	Infra capability with infra asset	1
			Application capability with application asset	1
			Application capability with application asset and cooperation systems	1
			Architecture with applications and infra	2
			Infra assets with architecture skills and architecture assets	1
			Infra capability with infra asset	1
			Innovation with application	1
			IT personell with development infra and applications	1
			IT process with application development	1
			Monitoring and data analysis	1
			Security with application and infra	1
Other	Other	StrageyNotOutsource	Crucial strategical roles internal, strategic advice only	3
Other	Other	IsUsedInPractice	Model corresponds to what is used in practice	1
Other	Other	AdditionalFinding	80/20 ratio, never fully internal nor external	1
			Application development vendor comes with own software, processes and method	2
			Differences between what you think is done and what is actually done	1
			Management of outsourcing - IT vendor management	2
			Model becomes clear when working with it	1

Appendix 11 respondent role and preference for detail

There are three horizontal categories: less detail, current state and more detail. Less detail refers to the belief of respondents that the model contains too much detail and prefers working on a more abstract level. Current state means that the model in its current level of detail is preferred. More detail means the respondent believes more detail is needed to use the model properly. Respondents are placed in the lower row, if the respondent was indirectly or not involved in the outsourcing decision (respondent 1,2,3,4). Respondents in the upper row were directly involved in the outsourcing decision (respondent 5,6,7). The figure is filled with respondents' recommendations regarding the level of detail and can be recognized by the number of the respondent. Multiple numbers before the proposal indicate mentioning by multiple respondents.

Involvment in outsourcing decision	Less detail	Current state	More detail
High			5 – The model needs to be more detailed, otherwise the definitions are open for multiple interpretations 5 – As long as there is no existing cooperation with an outsourcing partner, more detail is needed. Less details could be used in the future. Otherwise there is a risk a third party takes advantage of the situation. 6 – Outsourcing is a complex affair, you need more detail to align multiple parties 7 – You need to describe in more detail what you have and want to outsource, so you can make an overall better decision.
Low	2, 4 – Less detail would be more suitable when outsourcing to less mature organizations, such as digital start-ups 3 – I don't believe organizations are interested in these details, they want to outsource their IT as a commodity, regardless of how the supplier delivers this. 3 – Outsourcing decisions are based on a cost/benefit consideration, you don't need this level of detail to determine this	1 - More details would make the model too organization-specific 1 - More details would make the model less practical	2 – There is never enough detail in outsourcing decisions 2 – More detail works in our situation specifically because there are many complex legacy applications 4 – Depending on the complexity of the outsourcing you could need a higher level of detail
		Level of detail preferred	

Figure III – respondents' opinion regarding the preferred level of detail in relation to their involvement in outsourcing decisions.

High involvement in outsourcing decisions generally means a preference for more detail, whereas low involvement consequently means a preferred more abstract model. Only one respondent believed the current state detail is preferred. Respondents indicate the level of detail to be dependent on complexity of the outsourcing and organization maturity.

Appendix 12 intended applications and model completeness

Table V – intended applications of the model in relation with what respondents mentioned as an addition for completing the model

Main application is internal analysis	Main application is monitoring instrument
Business	Business
Services ITIL	Services ITIL
Legal IT aspects	Legal IT aspects
License management	License management
Project management department	Project management department
Middleware	IT personnel management
CMDB	IT Finance / Control
Database management	Infrastructure Logic
Data management	Portfolio management
End user training sub categories	
IT Vendor Management sub categories	
Office automation	
Security sub categories	